COMMODITY AGREEMENTS AND THE NEW INTERNATIONAL ECONOMIC ORDER

by Gordon W. Smith

Support for fundamental changes in international commodity markets has swelled considerably since 1973. Among others, Prime Minister Harold Wilson, the European Economic Community, and the United Nations Conference on Trade and Development (UNCTAD) have advanced their general plans for reform, and the United States is expected to do so shortly.[1] Several factors explain this rather sudden about-face by many governments. First, there was the commodity boom and bust of 1972-1975. Raw materials prices soared to unprecedented heights and appeared to lead the double-digit inflation which plagued most industrial countries. Then many commodity prices collapsed in late 1974 and 1975, leading to fears that future supplies would again be inadequate. Surely, many feel, something can be done to reduce such wild gyrations in prices (see figure 1).

Second, the so-called "Third World," strengthened by short-run commodity shortages, began to push much harder in the United Nations and other organizations for a "New International Economic Order." The New Order proposals start from two assumptions. 1) The current international economic system is heavily biased against the less developed countries (LDCs) and tends to retard their development. 2) The rich nations of the world have a duty to make far greater sacrifices than hitherto in order to alleviate the plight of the poor nations. A brief (not inaccurate) summary of the policy conclusion drawn from these assumptions is that in all international economic dealings, preferential and non-reciprocal treatment should be given to LDCs. In the law of the sea, for example, this would mean that LDCs would be the primary beneficiaries of deep sea mining. In international finance, LDCs should be the main (initial) recipients of new special drawing rights, the International Monetary Fund's "paper gold." In international trade LDCs should be given special tariff preferences. Technology should be transfered to LDCs on very favorable terms; and in primary commodities, our main interest here, the New Order would mean much higher, more stable raw materials prices, indexed to the costs of LDC imports from the industrial countries.[2]

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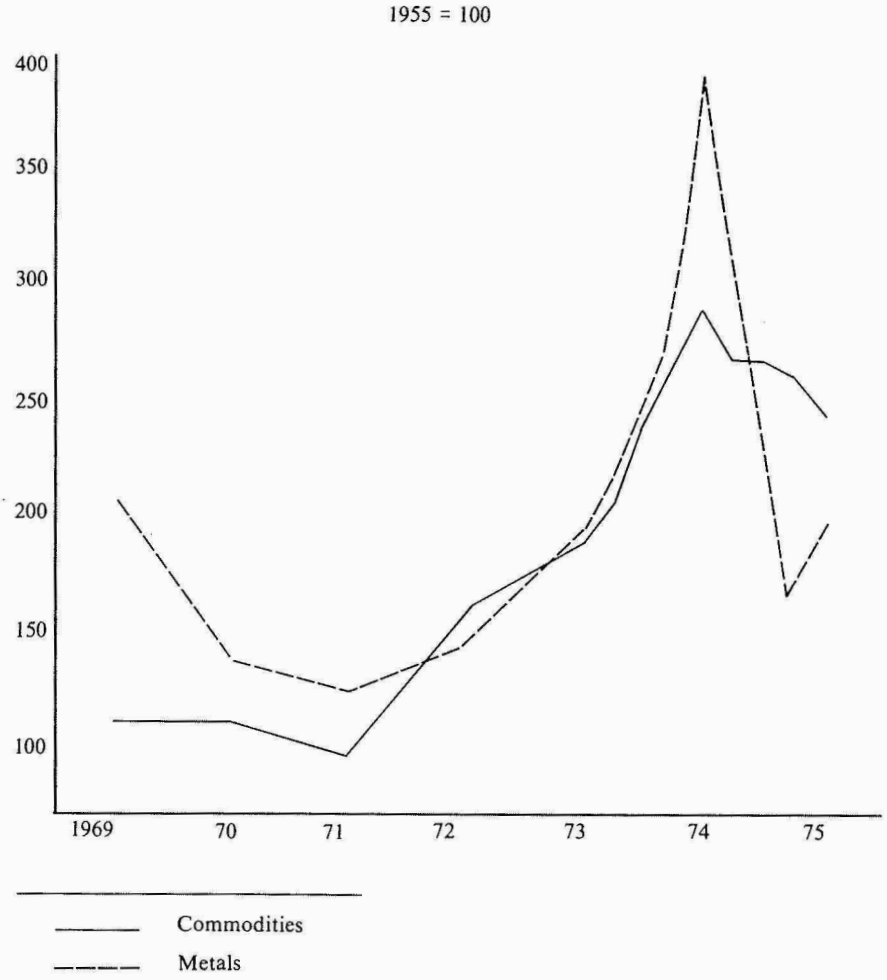


FIG. 1. *THE ECONOMIST*'S PRICE OF RAW MATERIALS 1969-1975.

In more "normal" times, the industrial nations probably would have listened politely to such demands and then ignored them as they had so often in the past;[3] now the Organization of Petroleum Exporting Countries (OPEC) has successfully tied the discussion of oil to that of other raw materials. The industrial countries can no longer be sure that refusal to yield on the raw materials front will not lead to retaliatory actions in oil.[4] Hence, many consuming nations have become much more "forthcoming" in other commodities than they otherwise would have been.

In addition, there has been much concern that producer cartels might form in commodities other than oil, and that OPEC money might be used to bolster their probability of success.[5] This fear was intensified by a proliferation of "producers associations" in raw materials ranging from iron ore, bauxite, and copper, down to tungsten. In most cases cartel-type action has not yet resulted from producer efforts, and calmer analysis since mid-1974 has led most observers to discount considerably the probability of successful cartels in all but a few commodities. Still, the threat cannot be dismissed entirely and is one motive for the change of heart in some of the developed countries.

Clearly the goals of the industrial nations in proposing new commodity arrangements are quite different from those of the LDCs. The industrial countries all want to avoid a repetition of the shortages of 1973. They want to forestall the development of producer cartels, and they want to assure an abundant, secure, long-term supply of raw materials. Some of those concerned also hope that pressure by petroleum suppliers might be relaxed somewhat in exchange for concessions by the developed countries in regard to other raw materials. Finally, most DC governments are seeking political good will with the LDCs, which they hope will spill over to favorable treatment in areas other than commodities.

The strong LDC demand for higher, and indexed, commodity prices, is unlikely to be accepted voluntarily by the industrial nations. The claim that raw material prices are "too low" goes at least as far back as Raul Prebisch's 1949 thesis that there is a long-run tendency for the terms of trade—export prices/import prices—to turn against raw materials exporters. Since there is no valid economic justification for the alleged tendency, Prebisch and his supporters in UNCTAD have concluded that it results from the exercise of some kind of "monopoly power" by the industrial countries. Accepting the premise, LDCs demand redress in the form of permanently higher prices.

Statistical evidence has never been decisive in the debate about the terms of trade. Even after a group of experts, convened by UNCTAD itself in late April 1975, agreed unanimously that the pertinent statistics did not provide any clear evidence of a long term deterioration in the net barter terms of trade of developing nations, New Order advocates persist in their assertions.

In any case, Third World demands for permanently higher and indexed raw materials prices would require the end of international markets as they currently operate. Supplies would have to be lowered below market equilibrium levels, and mechanisms to guarantee the restriction would have to be created. Export or production quotas would be necessary in many countries, and cooperation of the importing nations would be required to prevent extensive cheating. The problem of *quota allocation* is extremely difficult. Usually quotas have been determined by past production or export performance.[6] This procedure tends to freeze the pattern of production, and in the case of many minerals, where new discoveries are occurring constantly, quotas ultimately would generate gross distortions in the location of production.

Indexation would compound the problem. Indexation links a price or another monetary value to some general index of prices, normally as an adjustment for inflation. Escalator clauses which tie wages to the cost of living index are probably the most common example, although some countries also index the face value of government bonds and other financial assets. Rigid indexation of commodity prices, however, makes little economic sense. It would lock in relative prices at levels which could rapidly become unsupportable without the kinds of controls discussed above. The resulting misallocation of resources could be serious, while the technical obstacles to calculating "appropriate" price indices for the indexation procedure are formidable indeed.

For these "technical" reasons alone, there is very little chance that the industrial countries will agree to enforce higher than equilibrium prices in world raw materials markets. Nor, in spite of the rhetoric, is it clear that many LDCs realistically expect them to agree.

This does not mean that nothing constructive can be done on the raw materials front. To the contrary, both groups of countries would seem to have a mutual interest in attacking the extreme price *instability* plaguing many of the industrial raw materials. For many LDCs, unstable commodity prices translate into very unstable and unpredictable export earnings, often upsetting all attempts at consistent and rational economic planning;[7] but the industrial countries also lose from extreme price instability. Uncertain cash flows probably reduce the level of investment and production in raw materials ventures. Furthermore, raw materials price swings tend to aggravate the underlying inflationary and recessionary forces in the industrial economies. This has been most apparent in the 1972-1975 period, when raw materials prices exploded in the face of fears that supplies were reaching the point of nonavailability (see figure 1).

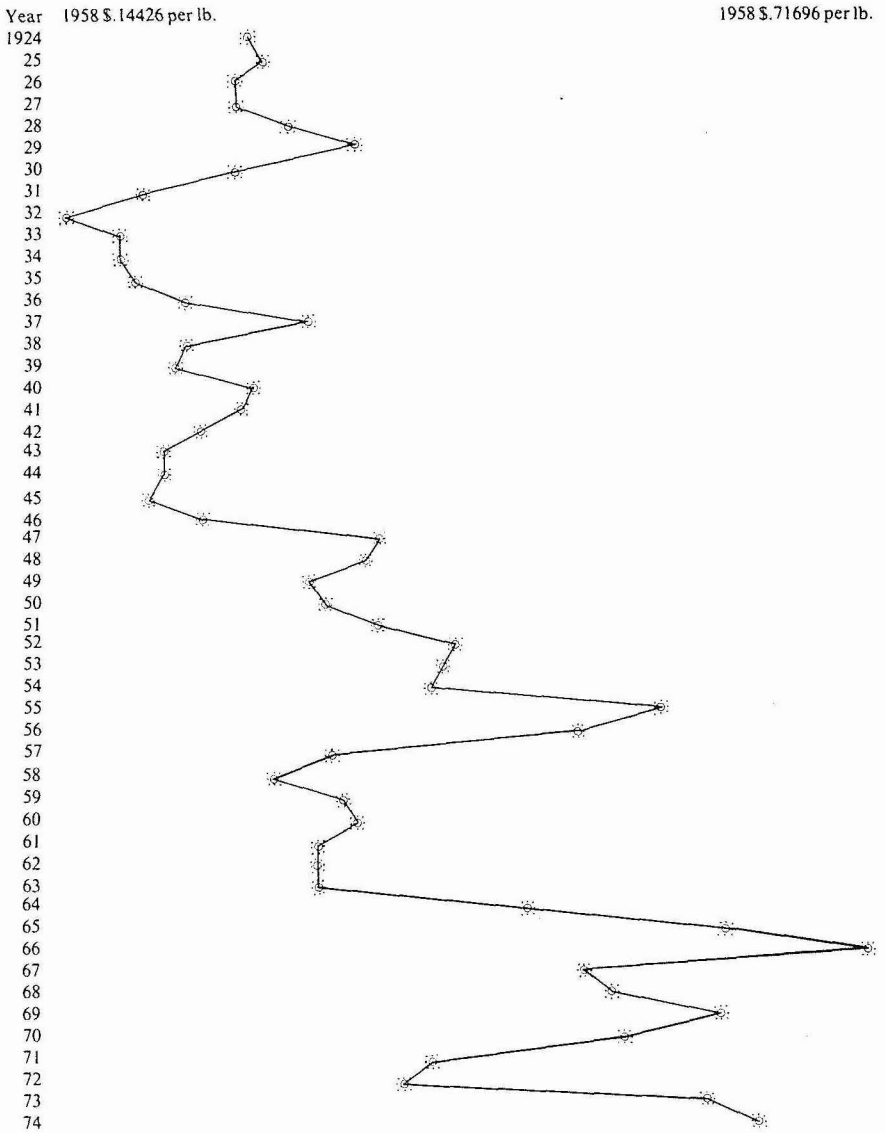
At this point, the perceptive reader may ask why there is a problem at all. Private market speculation should be able to take care of price instability, at

least to the extent that is socially desirable. The speculator could buy and store in times of low prices and sell in times of high prices. As long as the price rose over the holding period more than the speculator's interest, storage, and other costs, he could make a profit; and if the speculator could not show a profit, the degree of stabilization achieved would cost more than it was worth socially.[8] This line of reasoning has a certain appeal; but one thing is patently clear—private speculators have not in fact done a particularly good job in stabilizing the prices of industrial raw materials.

The reasons seem fairly straightforward. Future expected prices can be estimated with some precision only over a short time. When predictions extend much beyond a year, forecasts become extremely precarious and will be heavily discounted. The fact that no futures or forward market contract in raw materials extends beyond eighteen months reflects the extreme uncertainties of the forecasts. Unfortunately, the price cycles in many commodities are much longer than a year and a half—perhaps longer than ten years; and they tend to be irregular. (Consider the long price cycles for copper in figure 2, for example.) Private speculators facing the possibility of bankruptcy on the *downside* are not likely to be risk-neutral. They will require a very high risk premium for very risky speculation, i.e., for exactly the longer term speculation required for greater market stabilization. Private speculators must expect very large price increases to compensate for risk if they are to store in anticipation of sales several years hence. As a result, optimal speculation from the private point of view will still permit substantial fluctuations in prices.

Furthermore, one can safely forecast that large shocks to these markets *will* occur: wars (Korea, Mideast, Vietnam, etc.), unusual inflation and recession, associations like OPEC, etc. What cannot be forecast well in advance is the *timing* and *severity* of the shocks. Therefore, private speculators with their risk aversion and fear of downside bankruptcy will be unable in general to dampen price fluctuations from these sources to any appreciable degree. Indeed, speculators may temporarily aggravate the impact of the unexpected shock, as evidence on speculative price run-ups in 1973-74 suggests.

Since unaided private speculation has not dealt and cannot be expected to deal effectively with longer-term price instability, several official sources have proposed producer-consumer commodity agreements to solve the problem.[9] The main tool of such agreements in minerals would be the "buffer stock." In essence, a buffer stock would act as a longer-run supplement to the private market forces of demand and supply. It would buy in periods of glut and sell when private market supplies are unable to prevent large price increases. In principle, a buffer stock need not alter longer-run price trends. Rather, its goal should be to reduce instability around longer-run equilibrium price trends.



Sources: American Bureau of Metals Statistics, *Yearbook on the London Metals Exchange*, and the *Economic Report of the President*, 1975.

FIG. 2. ANNUAL AVERAGE DOLLAR PRICE OF COPPER (per lb.) on the London Metal Exchange Divided by the U.S. GNP Deflator (1924-1974).

Because they would be publicly financed, with the credit of governments their ultimate guarantee, buffer stocks need not fear bankruptcy nor need they be averse to risk. Thus they could take the longer view and commit more resources to inventories than could the unaided private sector.[10]

Unfortunately, an effective buffer stock has never been tried in primary commodities. It is true that the International Tin Agreement has relied on buffer stocks to a considerable extent, but their size has been so small as to preclude much stabilizing effect.[11] While the idea of buffer stocks may sound attractive, we have little to go on in judging their practical feasibility. How large a stock would be required? How should it be operated? How should it fix the target price around which market prices will be stabilized? Would its benefits outweigh its costs? Some tentative answers to these questions emerge from a study on the desirability of copper buffer stocks.[12]

Copper is one of the more likely candidates for a producer-consumer commodity agreement. It vies with aluminum as the second most important metal in the world (by total value of production). Copper is also especially volatile in price (see figure 2). Macroeconomic instability in the industrial countries is the prime cause of copper price volatility. Copper is used mainly in the manufacture of electrical machinery and equipment—that is, investment goods and consumer durables. Hence the demand for the metal rises and falls with the business cycle, but with considerably greater amplitude than the economy as a whole. Supply is fairly elastic with respect to price within the "normal" range of output, but tends to increasing inelasticity as the extremes of capacity utilization are approached. Thus at least three times in the last twenty years (1954-55, 1964-65, 1973-74) capacity was strained during economic boom and prices skyrocketed; and three times in the ensuing economic recessions prices plummeted below costs.

Supply disturbances have also occurred from time to time. The year 1973, for example, saw civil disturbances in both Chile and Zambia, large suppliers of copper. But as a rule supply shocks have been much less important to copper than to the principal agricultural products, for which weather is crucial.

For the LDCs, copper exports are outdistanced only by export of petroleum. Three countries—Chile, Zambia, and Zaire—depend on copper for well over two-thirds of their foreign exchange earnings (see table 1), and consequently have suffered great and chronic instability in their balance of payments. Almost half of world exports of copper, however, are accounted for by the developed countries, mainly Canada and Australia.

The chief problem with copper for both users and producers is its price instability. Undoubtedly the best way to deal with the problem would be to eliminate its principal cause, the business cycle in the industrial countries. In lieu of this unlikely event, buffer stocks become the main instrument

TABLE 1
SHARES OF LDC EXPORTS OF SIX MINERALS, 1970-1972

Per Capita Income of Major Commodity Exporters		Country Share of World Exports 1970-1972						Commodity Share of Country Exports 1970-1972					
		Bauxite	Copper	Iron Ore	Lead	Tin	Zinc	Bauxite	Copper	Iron Ore	Lead	Tin	Zinc
$0 - 250													
Bolivia	$208[A]				1.48	13.69	1.81				3.74	52.46	7.18
Haiti	80[A]	2.41						15.58					
Liberia	(250)[B]			6.23						72.69			
Mauritania	(180)[B]			2.77						77.16			
Morocco	223				2.69						2.46		
Nigeria	(130)[B]					4.86						2.08	
Sierra Leone	158[C]	2.48						6.51					
Zaire	96.7		9.99			2.64	3.27		68.34			3.00	3.85
India	(110)[B]			5.80						7.13			
Indonesia	106	2.23				8.47		0.49				5.04	
Philippines	242		4.16						16.23				
Thailand	183					10.34						8.84	
Sub-total		7.12	14.15	14.80	4.17	40.0	5.08						
$250 - 500													
Brazil	$395[A]			8.53						7.04			
Dominican Republic	347[A]	5.51						5.67					
Guyana	320[A]	6.91						13.33					
Peru	304[A]		4.63	2.43	6.48		7.08		21.72	6.70	3.34		5.70
Angola	(390)[B]			1.29						7.59			
Zambia	335[C]		17.02		1.42		1.68		94.10		.86		1.60
Malaysia	362	2.16				42.59		0.34				17.87	
Sub-total		14.58	21.65	12.25	7.90	42.59	8.76						
$500 - 1000													
Chile	$564[A]		16.26	2.28					71.60	5.91			
Jamaica	651	32.17						25.47					
Mexico	667[A]				4.31		6.43				1.36		3.17
Venezuels	979			5.27						4.21			
Surinam	(810)[B]	16.55						30.26					
Namibia	723[D]				2.67						25.93		
Sub-total		48.72	16.26	7.55	6.98		6.43						
Total		70.42	52.06	34.60	19.05	82.59	20.27						

Per Capita Income figures are derived from the following sources:
A) 1970-1971 Average; 1973 Statistical Yearbook, United Nations, New York, 1974, p. 590.
B) 1972 GNP per capita; World Bank Atlas: Population, Per Capita and Growth Rates, Washington, D.C., 1974, pp. 12, 14, 18.
C) 1970 only; 1973 Statistical Yearbook, p. 590. D) Per capita income for South Africa, including Namibia; 1973 Statistical Yearbook, p. 590.
Figures pertaining to exports are derived from: Commodity Trade and Price Trends (1974 Edition), Document of the International Bank for Reconstruction and Development, International Development Association, Report No. EC-166/74, pp. 20-25.

which might dampen price volatility without raising prices over the long run. But could a copper buffer stock function effectively? In an attempt to answer this question, we ran simulations of the Charles River Associates-Wharton EFA econometric model of the world copper market, probably the best model of this metal. Our procedure was to introduce a hypothetical buffer stock into the copper market during the historical period 1955-1973. The simulations then determined the buffer stock's impact on prices, consumption, producer revenues, etc., and its cost of operation.

Clearly, simulations of econometric models of the past give imperfect guidance for the future.[13] Market structures will undoubtedly change and the patterns of future economic fluctuations and supply disturbances will not duplicate the past. Still, simulations do permit order of magnitude conclusions, and this is their only goal in the present context.

Before we turn to the simulation results, some discussion of the principles of buffer stock operation is in order. A buffer stock can be described by its rules of buying and selling and the financial resources which are put at its disposal. These, in turn, are determined by the objectives which the buffer stock is designed to achieve. For the present analysis the hypothetical copper buffer stock is designed to stabilize prices within certain bandwidths around *long-run trend prices*. The upper bound on desired prices is called the "ceiling" and the lower bound, the "floor." The long-run trend price is called the "target" price in this paper. The buffer stock sells out of its stock to keep the market price from penetrating the ceiling and buys for inventories when the market price would otherwise go through the floor.

The *bandwidth* of permissible price fluctuations is very important in the operation of a buffer stock. A narrower band will bring greater price stability but will require more buffer stock intervention to defend the floor and ceiling. Very narrow bands also guarantee that the buffer stock will lose money, because the main source of net revenue from the operation is the difference between average buying and selling prices, which will be smaller the narrower the permissible bands of fluctuations. In general, the band should be wide enough to cover interest, storage, and transactions costs. In the simulations we used three alternative bandwidths: $\pm$ 5%, 7.5%, and 10% centered on target prices.

The choice of each year's target price is critical. If the target is consistently set above long-term equilibrium values, the buffer stock will be a net purchaser of copper, will suffer large financial losses, and will distort resource allocation. On the other hand, target prices far below long-run trend values mean that the buffer stock will rarely purchase copper to defend the floor, and hence will have insufficient stocks to defend the ceiling. The buffer stock will make a profit, but will have minor impact in reducing price fluctuations.

How should the target price be set? Preferably, at its "long-run trend" value according to the objectives of the buffer stock; but in practice this is an

ambiguous concept and one difficult to estimate. Five year lagged moving averages, adjusted annually, are one estimate of trend price which commends itself as a rule of thumb, mainly because of its simplicity and ease of application.[14] We use it in the simulations. It allows some accommodation to recent market forces, but greatly dilutes current events as indicators of longer-term trends. Steady upward or downward pressure would show up as steady upward or downward movements in the lagged moving average.

Obviously, there are many other methods of estimating trend prices, and even the five-year length of the moving average is somewhat arbitrary. As will be seen below, however, this simple rule of thumb worked quite well in the simulations, so that there was no need to pursue more complicated approaches.

Unfortunately, the five-year moving average rule could not be used in setting the initial (1955) target price for simulation. The five years prior to 1955 included the commodity boom provoked by the Korean War scare. Average prices over the period 1950-1954 were far above long-run trend. We chose instead an initial target of 1967 $.45 per lb. of copper wirebar—a moderate support price fairly close to the full cost of production at that time. The weight given to market prices in calculating the target increased each year from 1956 to 1960, and by 1961 the five-year lagged moving average rule was in full force.

Finally, the question must be asked: which market price should be the target of the buffer stock operation? During the period simulated (1955-1973), the London Metals Exchange (LME) price of copper wirebar was the basis for transactions in all the world except the United States.[15] Thus it was used as the basis for calculating the target. The pound price was converted into dollars at 1967 exchange rates and then deflated by the U.S. wholesale price index. This procedure in effect *indexes* the target price. Real price, rather than nominal price, is the target.

To recapitulate, the buffer stock is simulated over the period 1955-1973. The operation buys and sells to maintain prices within three alternative bands ±5%, 7.5%, and 10% around target price, which in turn is calculated as the five-year moving average, lagged one year, of the real LME dollar price of copper. In order to determine the financial requirements of each rule, the buffer stock is assumed to have unlimited capital resources.

A summary of the simulation results is presented in table 2 and figure 3. They show that relatively simple buffer stock rules could have brought dramatic reductions in price fluctuations during the simulation period without great social cost. True, the ±5% band is much too narrow, and as a result loses $850 million (in 1967 prices). Discounted real buffer stock losses in the 10% simulation, however, were quite moderate, averaging $13 million per year over the 1955-1973 period. To give some idea of relative size, a .3%

TABLE 2

SIMULATIONS OF THE IMPACT OF HYPOTHETICAL BUFFER STOCK to Maintain Price Within ±5, 7.5, 10% Around 5-Year Lagged Moving Average, 1955-1973

Initial Price = 1967 $.45/lb.

Variable/Simulation	5%	7.5%	10%
Real LME Copper Price in $[1]			
Largest Percentage Annual Increase	9.3	12.8	41.8
Largest Percentage Annual Decrease	-7.9	-12.2	-13.1
Average Annual Percentage Increase	3.0	4.7	8.5
Average Annual Percentage Decrease	-2.7	-3.5	4.6
Discounted Real Producer Revenue (billion 1967 $)[2]	66.40	65.22	65.44
Percent Revenue differs from no buffer stock activity simulation	-3.8	-5.5	-5.1
Discounted Real Buffer[3] Profit (million 1967 $)	-847.9	-508.5	-208.5
Maximum Stock Reached (th. s. t.)	5450.6	4759.8	4020.7
Maximum Investment in Stock (1967 $ million)	4552.2	3703.8	2892.0
Average Investment (1967 $)	2531.6	1934.5	1350.5
Terminal Stock (th. s. t.)	1169.1	154.6	0

Notes:

1. The LME price was converted to dollars and then deflated by the BLS Wholesale Price Index.

2. 2% real discount rate, 1% ad valorem transactions costs and .65% ad valorem annual storage costs were assumed.

3. (Sales minus purchases minus storage and transactions costs), all in 1967 $ and discounted back to 1955, the beginning year of the buffer stock.

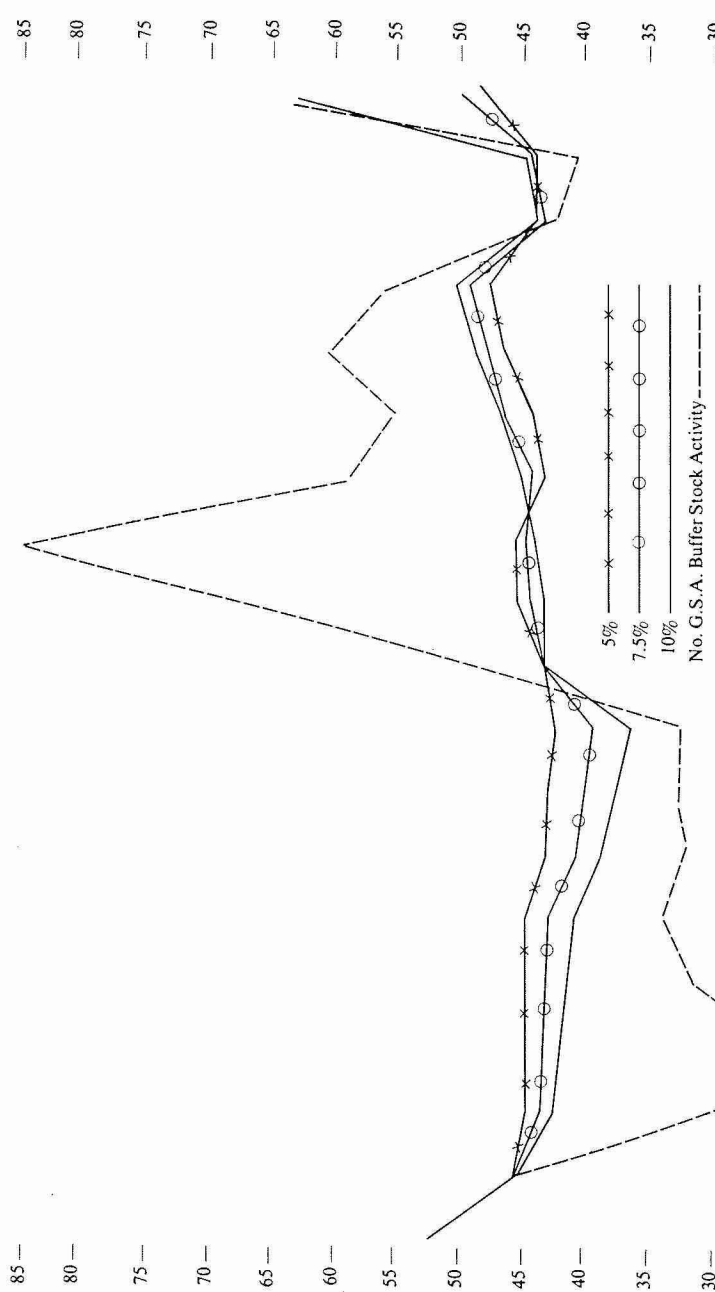


FIG. 3. SIMULATED LME PRICE 1967 cents per lb. Buffer stock rule to maintain price within ±5%, ±7.5%, and ±10% bands of lagged moving average.

tax on the discounted value of world copper sales would have sufficed to pay for losses under the 10% rule. Work not yet completed suggests that a ±15% rule would actually have made a profit, but at the cost of greater price instability.

The simulations give considerable support to those who argue that a long-term copper agreement to stabilize prices within some band (something like ±10% seems most reasonable) around price trends would bring substantial improvement in the operation of the copper market at very little cost. It would have to be understood from the beginning that price *stabilization*, not artificial increases in long-run copper prices, would be the goal of the agreement. Production and export controls would not be permitted in the agreement. The initial target price should be set as closely as possible to long-run equilibrium prices.[16] Then some mechanical rule, such as the "crawling peg" (five year moving average) used in the simulation, should be used to adjust target prices annually.

The main, and probably decisive, factors militating against such an agreement are the size of the financial commitment and the patience that would be required of the parties to the pact. In the simulations, a total investment on the order of $3 billion (in 1967 prices) was tied up in copper stocks for several years running. At its maximum, the buffer stock held in storage sufficient copper to satisfy all demands (except from communist countries) for the metal for at least eight months. This amount is much larger than the figures mentioned by the proponents of a copper agreement, and it would be extremely difficult to negotiate an agreement of such magnitude.

In the simulations, the first sale from stock took place only in 1965, in the *eleventh year* of the agreement. Until that time, all operations had been in support of the copper price floor. Surely by that time the consumer member nations would have begun to suspect that the agreement was stacked in favor of copper producers. Probably the consumer nations would have forced large reductions in the target price, which would have reduced the effectiveness of the agreement over the long run,[17] or perhaps the agreement would have collapsed. Other work which has been done with tin, lead, and zinc led to qualitatively similar conclusions to those reported for the copper in this paper.[18]

In a sense, the conclusions of the analysis are both optimistic and pessimistic. There does appear to be real foundation to the notion that both consumers and producers—both industrial and less developed countries—could benefit from the right type of commodity agreement, but the "right" type requires all sides to be far more forthcoming in financial resources than they are likely to be. "Façade" agreements, such as those we have had in tin and coffee, are thus likely to be the result. The ineffectiveness of façade agreements would soon be exposed by market forces, probably amidst bitter recriminations from all sides.

NOTES

This paper was written while the author was a senior international economist at the U. S. Treasury. I would like to thank Thomas D. Willett for helpful encouragement and George R. Schink of Wharton EFA for running the simulations of the copper buffer stock.

1. See, for example, *World Economic Interdependence and Trade in Commodities,* presented to Parliament by the Prime Minister, May 1975, especially pp. 1-15; UNCTAD, *An Integrated Programme for Commodities*, TD/B/C.1/166, 9 December 1974.

2. See, for example, UNCTAD, "The Indexation of Prices," TD/B/503, 6 August 1974; Sixth U. N. General Assembly "Declaration of the Establishment of a New International Economic Order."

3. The first UNCTAD meeting in 1964 was the source of much of the content of the "New Order."

4. After OPEC refused to talk oil alone at the first petroleum producer-consumer conference in the spring of 1975, the consumer nations finally relented in their insistence on separating oil from other raw materials.

5. See C. Fred Bergsten, "The Threat from the Third World," *Foreign Policy* **11**, pp. 102-124.

6. This has been the case in the Coffee Agreement, for example, since its inception in 1962.

7. Chile is perhaps the most extreme case. It depends upon copper for two-thirds of its foreign exchange earnings.

8. This scenario assumes that there are no externalities from price fluctuations and that all prices accurately reflect social benefits and costs. Both assumptions have been attacked, but their accuracy is not crucial for the present discussion. I argue that even without externalities and market distortions, private speculation will be suboptimal.

9. Commodity agreements are an important part of the European Economic Community, the UNCTAD, and the English proposals. France has long favored commodity agreements, while the U. S. has generally opposed them.

10. One *could* design re-insurance or loan availability programs which could greatly reduce downside risk to private speculators. These programs, "subsidies" to speculation, would almost certainly be politically unacceptable.

11. See Gordon W. Smith and George Schink, "The International Tin Agreement: A Reassessment," U. S. Treasury OASIA Discussion Paper, July 1975.

12. See Gordon W. Smith, "Internationally Held Buffer Stocks," U. S. Treasury-OASIA Research, April 29, 1975 (mimeograph).

13. One wag has defined econometrics as: "a field of economics which specializes in predicting the past with ever increasing accuracy."

14. The target price for the current year is estimated as the average of the previous five years. Next year's trend price is calculated by adding this year's price and dropping that of six years ago, and so forth.

15. Most transactions in the U. S. take place at the producer's "list" price, which is not market clearing.

16. $.70/lb. of copper wirebar is often suggested.

17. This would have been equivalent to widening the band of permissible price fluctuation.

18. See Smith, "Internationally Held Buffer Stocks."